TABLE 2—Incidence of Acute Myeloid Leukemia per/100,000 Population for 59 Iowa Towns (all ages) 1969–84, excluding 1972

	Male		Female		Male & Female		Total Cases	
	Direct Rate	(95% CI)	Direct Rate	(95% CI)	Direct Rate	(95% CI)	Male	Female
Group 1 (N=14)	2.5	(1.1, 4.0)	1.2	(0.2, 2.1)	1.6	(0.5, 3.4)	12	8
Group 2 (N=18)	2.6	(1.6, 3.7)	1.3	(0.7, 2.0)	1.8	(0.6, 3.1)	24	17
Group 3 (N=27)	2.5	(1.5, 3.4)	1.8	(0.9, 2.6)	2.0	(0.7, 3.3)	25	22

Group 1 = High, RA-226, > SPCi/L, 14 towns with an average population = 4,145 for a total of 812,616 person years.
Group 2 = Medium, 2.0 < RA-226 < 5.0 PCi/L, 18 towns with an average population = 8,155 for a total of 2,055,060 person years.
Group 3 = Low, RA-226 < 2.0 PCi/L, 27 towns with an average population = 4,154 for a total of 1,562,652 person years.

Discussion

These data do not support the strong relation between radioactivity in drinking water and leukemia incidence suggested by the Florida study.

Published studies on the association of radium in water with cancer are aggregate studies and subject to the biases associated with such designs. The results of the Iowa and Florida studies may to some extent be explained by misclassification and confounding.

In the case of water studies, a more accurate measure of exposure would be based on the amount of radium^{-226} water consumed by each individual and the examination and adjustment for confounding etiologic factors. The amount of radium^{-226} in drinking water in these communities is subject to a variety of factors including home water softening, varying tap water consumption, duration of residence in the community, and so forth.

In the Florida study, a county was defined as high exposure on the basis of 10 percent of the sampled wells exceeding the EPA limit for radium. The Iowa study has the benefit of accurately defined exposure categories in a demographically stable area. Despite similar study designs, this study does not yield the strong association previously reported with leukemia. Future study of cancer incidence and radium concentration in drinking water in these and other communities is needed to clarify the risk of leukemia secondary to naturally occurring Ra^{-226}.

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Survey of Occupational Exposure of Waste Industry Workers to Infectious Waste in Washington State

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Abstract: We surveyed 940 Washington state waste industry workers to evaluate occupational exposure to potentially infectious materials (response rate 47 percent). Only 26 percent were trained specifically to deal with safety hazards associated with medical waste. For the year preceding the survey, 50 percent of respondents reported having received cuts and scratches on the job, 22 percent reported direct contact with waste blood on their clothing or shoes, 8 percent had blood exposure on their skin, 3 percent blood exposure on their face or eyes, and 6 percent occupational hypodermic needlestick injuries (10 percent among waste collectors). (*Am J Public Health* 1990; 80:1262–1264.)

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Introduction

Medical waste disposal has recently emerged as a concern for waste industry workers. The AIDS (acquired immunodeficiency syndrome) epidemic has elevated waste worker concern regarding the potential for disease transmission from medical waste stream sources. Such transmission of AIDS or hepatitis B has never been epidemiologically demonstrated.[1]

Few studies have been conducted to examine waste industry worker exposure to potentially infectious agents in the waste stream. Gellin and Mitchell examined 97 waste workers employed by the City of Cincinnati during January and February of 1968 for skin disorders.[2] Forty-one cases of bacterial, viral, or fungal dermatitis were observed in this group, but all were classified as non-occupational in origin.

Cimino examined New York City Sanitation Department health records of waste workers employed between 1968–69.[3] Needlestick injuries were reported due to the presence of uncontained needles in waste collected from hospitals, physician's and dentist's offices, and discarded needles from drug addicts. All workers reporting needlestick injuries were given

gamma globulin prophylaxis and no cases of hepatitis were reported.

A 1979 report by Clark, *et al*,[4] examined the incidence of viral infection among 43 waste collection workers. Sera antibody levels for 18 viruses were examined from blood samples collected during the spring and fall. The authors found no evidence of increased occupational risk to blood-borne viral infections.

This study was conducted to examine occupational exposure of Washington state waste industry workers to blood-contaminated waste and discarded hypodermic needles in the municipal waste stream.

Methods

The survey was conducted during February and March of 1989. Questionnaire packets were prepared and delivered to seven private sector waste industry firms and six public sector waste collection/disposal agencies. Selection focused on the state's population centers, although rural participation was included. Industry names were obtained through the Washington Utilities and Transportation Commission records and public sector solid waste utility listings. A total of 940 questionnaires were distributed to waste workers directly involved with waste collection or disposal within these firms or agencies. Based on the number of waste workers identified in the 1980 census which was adjusted for population growth and a review of non-participating firms, the surveyed workers account for approximately 70 percent of the waste industry workforce in Washington state.

Participant responses were confidential and not individually identified. Questionnaires were returned directly to the research group by the participants in stamped return envelopes without review by their respective waste industry employers.

Participants included those involved with residential waste collection, commercial collection, and landfill/transfer station operations. Waste worker job categories included heavy equipment operators, truck drivers, collectors, equipment maintenance personnel, laborers, recyclers/sorters, gatekeepers/scalehouse operators, and field supervisors.

Survey variables included the respondent's job category, job safety training, occupational observance of medical waste, exposure to blood-contaminated waste, and occurrence of hypodermic needlestick injuries. Questions regarding occupational exposures or injuries requested that the respondent include the month and year of his/her most recent event to discourage a positive response unless a specific occurrence could be recalled.

Results

Of 940 surveys distributed to waste workers, 438 were returned (47 percent). Of these, 52 percent of respondents conducted all or part of their job activities in residential waste collection, 41 percent in commercial waste collection, and 38 percent in landfill/transfer station operations.

Sixty-nine percent of the respondents reported receiving job safety training. Twenty-six percent indicated that this training included medical waste safety practices. Ninety percent of the respondents reported observing medical waste (e.g. needles, blood, bandages) in the waste stream. Of this group, the frequency of observation of medical waste was identified as daily by 27 percent of this group, weekly by 40 percent, monthly by 17 percent, yearly by 8 percent and less than once a year by 8 percent.

Injury/exposure information for occupational cuts and scratches, blood exposures, and needlestick injuries is based on the respondent's recall for events occurring on at least one occasion. Such information reported for the year preceding the survey required the respondent to include both the month and year of their most recent event.

Cuts and scratches received on the job were reported by 74 percent of the respondents. For the year preceding the survey, such injuries were reported by 50 percent of respondents.

Thirty-two percent of the respondents reported having experienced direct contact with blood on their clothing or shoes, 13 percent on their skin, and 5 percent on their face or eyes. For the year preceding the survey, 22 percent reported having experienced direct contact with waste blood on their clothing or shoes, 8 percent had blood exposure on their skin, and 3 percent had blood exposure on their face or eyes.

Twenty-one percent of responding waste workers reported having been stuck or scratched by a waste hypodermic needle. Six percent reported that their most recent injury occurred within the year preceding the survey. Such injuries were reported by 10 percent of waste collectors within the same time period. Needlestick injuries were reported by 24 percent of respondents for residential waste collection, 21 percent for commercial waste collection, and 11 percent for landfill/transfer station operations. Needlestick events by individual job category are presented in Table 1.

Discussion

In this survey, the low response rate (47 percent) may have resulted in a higher estimated incidence of exposure; exposed individuals should be more likely to respond if an exposure is a memorable experience. If one assumes that none of the non-responders had experienced an exposure and only respondents who could give both the month and year of the event actually experienced an exposure, the estimated exposure incidence among the 940 persons sent a questionnaire for the year preceding the survey would be 10 percent (blood exposure to clothing or shoes), 4 percent (blood exposure to skin), 1.5 percent (blood exposure to face or eyes), and 3 percent (needlestick injuries).

Of greatest potential significance to waste worker health was the reporting of needlestick injuries. Written survey comments from workers described loose needles originating from uncontained disposal or ruptured sharp containers in the waste stream. Needles were identified originating from both residential and medical facility sources. Accounts of uncontained

TABLE 1—Needlestick Injury by Waste Worker Job Category for the Year Preceding the Survey

Primary Job Category	Number (%) of Respondents	Number and Proportion (%) of Respondents Reporting Needlestick Injury
Heavy Equipment Operator	27 (6)	1 (4)
Truck Driver	79 (18)	2 (3)
Collector	241 (55)	23 (10)
Equipment Maintenance	19 (4)	1 (5)
Laborer	23 (5)	1 (4)
Recycler/Sorter	2 (0.5)	0 (0)
Gatekeeper	23 (5)	0 (0)
Field Supervisor	18 (4)	0 (0)
Total	432	28 (6)

*Needlestick response requires respondent noting month and year of occurrence.

needles and the reporting of needlestick injuries sustained by waste workers indicate the need for proper handling, containment and/or destruction of needles by users prior to disposal.

Observation of medical waste (e.g. needles, blood, bandages) in the general waste stream was common (90 percent of respondents). Further study to identify frequency of occupational exposure to blood is recommended, especially in relation to proposed standards for bloodborne pathogens by the US Department of Labor, Occupational Safety and Health Administration.[5]

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Fear of AIDS and Attrition among Medical Technologists

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Abstract: Attitudes toward AIDS were measured by a survey of 212 attendees at the annual meeting of the New Jersey Society for Medical Technology. Twenty five percent of the respondents were considering leaving the profession because of a fear of AIDS. In addition, almost half would not have chosen the field knowing they would be handling HIV-positive samples. This high degree of concern may be an important factor contributing to the shortage of medical technologists. (*Am J Public Health* 1990; 80:1264–1265.)

Introduction

A 1988 survey by the American Society of Clinical Pathologists reported that 9 percent of medical technologists positions are vacant and more than 75 percent of laboratory managers perceive a shortage of qualified laboratory personnel.[1] The shortage among medical technologists has been attributed to a wide spectrum of problems: low pay with a compressed salary structure, lack of upward mobility, job stress, poor working conditions, lack of professional recognition, and increased opportunities in other professions that have commensurate educational requirements.[2,3]

A survey conducted in 1987 among New England laboratories, reported that 39 percent of the respondents mentioned fear of AIDS (acquired immunodeficiency syndrome) as a reason laboratory workers leave the profession.[4] A 1987 study, confined to medical technologists, also found a high fear of acquiring AIDS.[5] The purpose of our study was to describe attitudes of medical technologists toward working with AIDS-infected samples.

Methods

A questionnaire was designed which included 15 questions using Likert rating scales with the response options ranging from strongly agree to strongly disagree. Independent variables included demographic and institutional factors. Three additional questions dealt with an individual's knowledge of AIDS.

The questionnaire was distributed to registrants at the 1988 annual meeting of the New Jersey Society for Medical Technology. Of the 295 registrants, 283 were given forms to be filled out anonymously and 212 were returned (75 percent).

Results

The results showed that fear of AIDS among laboratory workers is common (Table 1). For example, 52 percent agreed with the statement that, despite precautions, it was likely that they could become infected with HIV because of laboratory exposure and 41 percent would like to transfer to a position that required less blood handling. Only 43 percent indicated that they would have chosen the profession knowing they would be handling samples from AIDS patients and one out of four respondents is considering leaving the profession because of a fear of AIDS.

Medical technologists are clearly experiencing pressure to seek a different career. In 86 percent of those queried, respondents reported that friends and family members expressed concern about their working with HIV samples and 53 percent knew of colleagues who had left the profession because of the possibility that they could acquire the human immunodeficiency virus (HIV).

On the other hand, there was general satisfaction with employer safety policies. Three out of four felt their employer provided adequate education concerning HIV risk and that adequate safety measures, which lower the risk of HIV transmission, were available. However, less than half felt that their employer offered adequate counseling in the event of an accident.

It was apparent that the AIDS problem had resulted in improved safety practices within the profession. For example, increased reporting of needlestick injuries and the wearing of gloves were reported by 87 percent and 94 percent of the respondents, respectively.

Not surprisingly, those currently working were more inclined to contemplate a career change than people about to enter the field. One in three of employed medical technologists was thinking about departing the profession because of their fear of AIDS. In contrast, only 13 percent of the students surveyed indicated they were planning to take such a step.

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